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Global tidal mapping from observations of a radar campaign

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Based on the one-month (October, 2014) wind observations of 11 radars distributed in both hemispheres along the 120E meridian during a radar campaign, this article reports on improvements of the tidal mapping technique proposed before (Yu et al., 2013) by extending the latitude coverage to the global scale (from pole to pole). We first present the tidal components decomposed from the wind observations at different stations. It is revealed that the tidal components are stronger at stations in the Northern Hemisphere than in the Southern Hemisphere. Then, Hough mode decomposition is performed to extract the contributions of different tidal modes for each decomposed tidal component. The expected dominant mode, (1, 1) mode, is the strongest. The trapped (1, 2) mode also contributes a lot to the diurnal component. Yet for the semidiurnal component, (2, 4) mode along with (2, 5) mode make considerable contributions. In contrast, (3, 5) mode has the strongest amplitude for the terdiurnal component. At last, the tidal mapping technique proposed before is improved to get the pole-to-pole structure of each tidal component, based on the extracted tidal modes. The mapped tidal components successfully construct the general latitudinal and altitudinal distributions, compared with the Thermosphere Ionosphere Mesosphere Energetics and Dynamics Doppler Interferometer (TIDI) observations and Global Scale Wave Model (GSWM-09) results. Comparison of the predicted and observed tidal wind (for example, at Wuhan Station) indicates the capability of the mapping technique for repro- ducing the local time and altitude variations of the original observations.